SECTION IV

The Research & Development Section conducts ongoing research into the causes of accidents, particularly those associated with the human component of the driving task (driver error, aging, faulty perception, risk-taking, etc.). As the etiology of accidents is explored and understood, it becomes possible to develop more effective accident countermeasures and to construct better prediction equations for identifying accident-prone drivers. The Section also conducts a limited amount of research in the development of improved statistical techniques and research methods for analyzing driving record data. As the relative success of various research methods is documented, future designs can be altered to ensure use of the most effective techniques available.

The Department maintains a permanent file of the driver records of a random 1% sample of California drivers. Information on accidents and convictions that would normally be purged after a certain period of time is retained for research purposes; thus the Department has a longitudinal sample of driving behavior which encompasses over 20 years of driving. This driver record file is used as the database for many ongoing projects.

TITLE: The 1964 California Driver Record Study (Report No. 20, Parts 1-9)

PART 1: An Introduction and Methodological Description

AUTHOR(S): California Department of Motor Vehicles
DATE: December 1964
NTIS NUMBER: PB-219127

PART 2: Accidents, Traffic Citations and Negligent Operator Count by Sex

AUTHOR(S): California Department of Motor Vehicles
DATE: March 1965
NTIS NUMBER: PB-219128

PART 3: Drivers by Age, Sex and Area of Residence

AUTHOR(S): California Department of Motor Vehicles
DATE: April 1965
NTIS NUMBER: PB-219129

PART 4: The Relationship Between Concurrent Accidents and Citations

AUTHOR(S): California Department of Motor Vehicles
DATE: May 1965
NTIS NUMBER: PB-219130

PART 5: Driver Record by Age, Sex and Marital Status

AUTHOR(S): California Department of Motor Vehicles
DATE: June 1965
NTIS NUMBER: PB-219131

PART 6: The Stability of Reported Accidents and Citations

AUTHOR(S): Ronald S. Coppin, Robin S. McBride & Raymond C. Peck
DATE: November 1965
NTIS NUMBER: PB-219132

PART 7: The Relationship Between Types of Convictions and Accidents

AUTHOR(S): Ronald S. Coppin, A. Lew & Raymond C. Peck

DATE: March 1966
NTIS NUMBER: PB-219133

PART 8: The Prediction of Accident Involvement Using Concurrent Driver Record Data

AUTHOR(S): Ronald S. Coppin, Raymond C. Peck

DATE: January 1967
NTIS NUMBER: PB-219134

PART 9: The Prediction of Accident Involvement from Driver Record and Biographical Data

AUTHOR(S): Ronald S. Coppin, Robin S. McBride & Raymond C. Peck

DATE: March 1967
NTIS NUMBER: PB-219135

FUNDING SOURCE: Departmental Budget

PROJECT OBJECTIVE:

The basic purpose of the overall study was threefold: (1) to provide data for operational and budgetary planning, (2) to provide basic descriptive and baseline data on drivers and driving record variables, and (3) to further understanding and knowledge about the nature and causes of traffic accidents.

SUMMARY:

Between September 1963 and March 1964, a random sample of 225,000 drivers was selected from Division of Drivers License files for the purpose of data collection and analysis. Nine reports were produced (listed under the heading Supplementary Information), but the major findings are contained in Reports 8 and 9:

Part 8 - The Prediction of Accident Involvement Using Concurrent Driver Record Data

Part 8 was concerned with the prediction of accident involvement using empirically generated formula based on concurrent conviction types and conviction counts. The major purpose of the study was to develop an optimum point-system definition of "negligent operator" by differentially weighting specific violation types in accordance with their association with accidents. An optimum system was defined as that which is most highly correlated with accident involvement (i.e., that which will select for negligent-operator status those subjects most likely to be involved in accidents).

Although several specific violation types made slight (but statistically significant) contributions to predicting accidents, the overall number of countable convictions was by far the most powerful accident predictor. The most accurate predictions of accident involvement were generated by using all possible driver record count variables, even though some violation types were more closely related to accidents than others. There was a gain in predictive efficiency if weights were empirically assigned for males and females separately. As a selection device, the optimum prediction system was only slightly superior to California's then-current point-system definition of negligent operator. The addition of extra weights for "major" convictions and the exclusion of

non-moving violations from California's negligent operator point system did not appear justified as a selection technique.

Part 9 - The Prediction of Accident Involvement from Driver Record and Biographical Data

Part 9 describes the joint relationship between various driver characteristics and accidents. In contrast to Part 8, this study included biographical data in the prediction equations and also generated equations from non-concurrent events (predicting 1963 accidents from 1961 and 1962 driver record data).

The total number of one-point convictions on a driver's record proved to be the best overall predictor of accident involvement for both concurrent and non-concurrent data, and the addition of violation types contributed little beyond that achieved by one-point convictions alone. Biographical information (age, sex, etc.) slightly increased predictability beyond that achieved by driver record variables alone; additional biographical information obtained through questionnaires (occupation, mileage, etc.) from a small sub-sample resulted in a two-fold increase in predictive accuracy. A number of differences were noticeable in comparing the male and female equations. The overall magnitude of the relationships was consistently higher for males than for females on both concurrent and non-concurrent events. The relative importance of the various violation and biographical variables in predicting accidents also differed by sex. The relationship between accidents and the predictor variables was higher for concurrent data than for non-concurrent data. A theoretical analysis of the data indicated that additional data about drivers (personality measurement, etc.) might result in a considerable increase in predictive efficiency. The resultant equations were also interpreted as providing evidence that some drivers are more accident-liable than others, but that their contributions to the overall accident problem are relatively small.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

This study has been used by the department in planning and policy formulation. The study findings have also been cited by some insurance companies in support of merit underwriting plans that charge lower premiums for drivers with good records.

SUPPLEMENTARY INFORMATION:

Part 5 published in *Highway Research Record*, *163*, 54-69, 1967, (Marsh W. C.). Summary of entire report by Peck and Coppin was published as Chapter 14 in *Accident Proneness*, Shaw, L. and Sichel, H., Pergamon Press, 1971, pp. 237-263. Also published in *Traffic Safety Research Review*, *2*(2), 34-41, 1967 as "The Prediction of Accident Involvement Using Concurrent Driving Record Data" (Peck, R. C., & Coppin R. S.) and in *Accident Analysis and Prevention*, *2*(4), 243-299 1971, as "The Distribution and Prediction of Driver Accident Frequencies" (Peck, R. C., McBride, R. S., & Coppin, R. S.).

TITLE: The Measurement of Warning Letters on Two Dimensions: Threat and Intimacy

AUTHOR(S): Robin S. McBride DATE: July 1967

FUNDING SOURCE: None

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:

To develop letters that vary in the degree of threat and intimacy of style for use with negligent drivers.

SUMMARY:

Nine warning letter models, structured at three different intensities on two stimulus dimensions, were rated by negligent drivers to determine if they evoked responses in accord with the author's conceptions of them. Biographical and personality data were also collected in order to obtain a description of the population, as well as to determine the relationship of these variables to the perception of a warning letter. The correlations between biographical/personality variables and the warning-letter ratings did not support strong, consistent relationships; however, subjective levels of threat and intimacy corresponded to planned levels. That is, rated threat increased significantly from low- to high-threat letters and rated intimacy increased significantly from the low- to the high-intimate letters. There was no significant interaction between the two variables; that is, the level of intimacy in the letters did not influence the perceived level of threat, nor did the threat level influence the perceived level of intimacy.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

This information was used in designing a large-scale warning letter study.

SUPPLEMENTARY INFORMATION:

Master's Thesis, California State University, Sacramento, 1967.

TITLE: Factor Analysis of Driver Record

AUTHOR(S): David M. Harrington

DATE: 1968

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:

To examine l8 variables and reduce them to a smaller number of representative basic dimensions.

SUMMARY:

Driver record data such as accidents, types of violations, license restrictions, and age were collected for approximately 43,000 males and 30,000 females for the period 196l-1963. Factor analyses of both the three-year concurrent and non-concurrent records revealed three driver record factors: (a) moving violation—descriptive of actual driving behavior and the types of errors made by drivers; (b) non-moving violation—reflecting the condition of the vehicle and other technical violations of the law, rather than driving behavior itself; and (c) paired accident-convictions—reflecting legal responsibility for an accident. It was felt that the results of this study substantially

confirmed most researchers' a priori idea of the factorial structure of accident and violation data.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
None.

SUPPLEMENTARY INFORMATION:
Published in *Traffic Safety Research Review*, *12*(3), 81-87, 1968.

TITLE: Driver Questionnaire Response Rate and Response Bias as a Function of Contact Strategy

AUTHOR(S): Raymond C. Peck & David M. Harrington

DATE: 1968

REPORT NUMBER: Unnumbered

FUNDING SOURCE: Departmental Budget

NTIS NUMBER: None

PROJECT OBJECTIVE:
To determine the optimum procedure for mailing questionnaires to drivers.

SUMMARY:
Questionnaires were mailed to drivers under a variety of strategies, such as type of delivery, number of contacts, type of letterhead, type of questions, and degree of anonymity. The results indicated that driver research questionnaires should be mailed as normal delivery on official departmental letterheads, using business reply envelopes and follow-up reminder letters. The best combination of strategies resulted in a response rate of 78%, compared to a rate of 44% for the poorest strategy.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
In numerous subsequent studies involving questionnaire contact, the Research and Development Section has incorporated the mailing strategies found to be most effective.

SUPPLEMENTARY INFORMATION:
None available.

TITLE: The Prediction of Driver Behavior Subsequent to Receipt of Official Letters of Reprimand

AUTHOR(S): Raymond C. Peck

DATE: July 1968

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:

To isolate factors that predict the quality of a driver's record following receipt of various styles of warning letters.

SUMMARY:

One of the factors evaluated in the study "Modifying Negligent Driving Behavior Through Warning Letters" (McBride & Peck, Report #30) was the use of an accompanying questionnaire. This questionnaire was found to have no effect on subsequent driving record. However, still unanswered was the question of whether the responses to the questionnaire were correlated with subsequent driving record. If so, the questionnaire could be justified as a device for isolating negligent driver subgroups who are likely to continue violating and require further driver improvement contact. This study tested that hypothesis by means of regression analysis, in which subsequent record was predicted from the information returned on the questionnaire. The multiple correlations ranged from .12 for accidents to .32 for convictions, indicating that the device was at least worthy of further research. Severity of previous driving record was found to be the best predictor, with drivers accruing the most negligent-operator points prior to the letter also having the worst records subsequent to the letter. Drivers who expressed a high degree of anger and a low degree of fear and disgust upon receiving the letter tended to have poorer subsequent prognoses.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

The results were not judged to have sufficient utility to warrant use of the questionnaire in the W/L program.

SUPPLEMENTARY INFORMATION:

Master thesis, California State University, Sacramento, 1968.

TITLE: The Relationship Between Field Dependence and Motor Vehicle Accident Involvement

AUTHOR(S): Richard M. Harano

DATE: 1969

FUNDING SOURCE: None

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:

To determine if any relationship exists between motor vehicle accidents and a perceptual response style referred to as field dependence (measured on response to figure/ground stimuli).

SUMMARY:

A random sample of Sacramento drivers who had at least three accidents within the preceding 3 years were designated the accident group. A non-accident sample was subsequently selected by matching subjects on age. Both groups were administered Witkin's Embedded Figures Test (EFT) to measure a perceptual response style referred to as field-dependent behavior. Information pertaining to age, marital status, driving mileage, occupation, traffic convictions, and verbal and quantitative ability were also

collected because of their known relationship to field dependence and to accident involvement.

Field-dependent subjects (those who take a relatively long period of time in locating the hidden figure in the EFT) were found to accrue more accidents than field-independent subjects did. This significant relationship existed not only for responsible accidents but also for reportable accidents.

The test for response bias revealed no significant differences between respondents and nonrespondents within each sample on age and traffic conviction record. Therefore the respondents and non-respondents could be regarded as members of the same underlying population on these parameters.

The results of this exploratory study on field dependence and motor vehicle accident involvement suggested that perceptual response styles, such as field dependence, may play an important role in the future of traffic safety research.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

This study was a pilot test. *The Prediction of Accident Liability Through Biographical Data and Psychometric Tests* (Harano, McBride, & Peck, Report #39) was a follow-up to see if field dependence should be included in the latter study. The results from that study did not show an overall relationship to accident involvement, but did show a relationship for some age groups. The relationships were not considered to be sufficient for incorporation of the test into departmental programs.

SUPPLEMENTARY INFORMATION:

A summary was published in *Journal of Perceptual and Motor Skills*, *31*, 272-274, 1970. Master's Thesis, California State University, Sacramento, 1963.

TITLE: The Relationship of Perceptual Style of Drivers to Accident/Violation Experience

AUTHOR(S): Patricia Isham

DATE: January 1970

FUNDING SOURCE: None

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:

To explore the ability of the Stimulus Accretion Impending Hazard (SAIH) test to measure drivers' propensity for accident or violation involvement.

SUMMARY:

SAIH test measures and biographical data were collected in order to develop a multiple regression equation for predicting the accident/violation frequency of negligent drivers.

It was concluded from these data that the SAIH test measures (patterned block removal, stimulus-search block removal, and pauses) and biographical information

(socioeconomic status, percent of urban driving, percent of freeway driving and weekly mileage) were significantly related to the violation experience of male negligent-operator drivers. The drivers who used more structured and comprehensive perception techniques (patterned and stimulus search) had fewer traffic violations. This lends support to the hypothesis that the "safe" driver is more efficient in perceiving the totality of environmental cues and in subsequently making appropriate driving reactions. However, the SAIH failed to discriminate between negligent operators with accidents and negligent operators without accidents.

Within the limitations of this study, its conclusions lend support to the hypothesis that the driver's perceptual style of response to environmental cues is related to driving success as measured by traffic violations.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
The findings were not regarded to be sufficiently promising to warrant incorporation of the SAIH test into any of the department's programs.

SUPPLEMENTARY INFORMATION:
Master's Thesis, California State University, Sacramento, 1970.

TITLE: Traffic Violations by Type, Age, Sex, and Marital Status

AUTHOR(S): David M. Harrington & Robin S. McBride

DATE: June 1970

REPORT NUMBER: 34

FUNDING SOURCE: Departmental Budget

NTIS NUMBER: PB-218851

PROJECT OBJECTIVE:
To examine how the distribution of violation types varies with such basic demographic variables as age, sex, and marital status.

SUMMARY:
Three years of driver record data were collected for a random sample of 147,984 drivers. The mileage-adjusted rate of speed, equipment, and major violations decreased with increasing age. Sign, turning, passing, and right-of-way violations had a U-shaped relationship with age (youngest and oldest groups had higher rates). Males had a higher rate than females for major violations, speed, equipment, passing, and turning violations. Similar age and sex differences were found for violations associated with fatal and injury accidents. Single persons averaged (not adjusted for mileage) a greater number of each type of violation than married persons.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
Not applicable; descriptive study only. The results have been used in making policy decisions, such as determining at what age level drivers would be ineligible for a program that allows license renewal by mail.

SUPPLEMENTARY INFORMATION:
Published in *Accident Analysis and Prevention*, *2*(1), 67-79, 1970.

TITLE: Prediction of Driving Behavior Following a Group Driver Improvement Session

AUTHOR(S): Robin S. McBride

DATE: July 1970

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: 33

NTIS NUMBER: PB-218937

PROJECT OBJECTIVE:

To determine the extent to which driving record subsequent to a driver improvement meeting could be predicted from a personality test and biographical questionnaire.

SUMMARY:

A variety of variables collected at the time of the group meeting and from the subject's prior driver record were regressed against subsequent negligent operator points. Negligent operators with relatively poor subsequent records could be discriminated from negligent operators with good records by the following: (l) worse prior record, (2) less emotional stability (as measured by the Gordon Personal Profile Test), (3) sex (males worse), and (4) age (younger worse).

These results were interpreted as evidence that relatively immature and poorly adjusted individuals profit less from the Group Driver Improvement Meeting and are more likely to require further restrictive action. The findings indicated that test instruments and diagnostic devices may prove to be a useful adjunct to the driver-improvement process. Although the results were promising, the author stressed the need to cross-validate before drawing any final conclusions.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

A subsequent and much larger study (Harano, Report #49) failed to confirm these results. Consequently, the prediction battery was not incorporated into DMV programs.

SUPPLEMENTARY INFORMATION:

Published in *Journal of Applied Psychology*, *54*(1), 45-50, 1970.

TITLE: A Position Paper on Accident Proneness and Driver-Oriented Safety Models

AUTHOR(S): Raymond C. Peck & Ronald S. Coppin

DATE: 1971

REPORT NUMBER: Unnumbered

FUNDING SOURCE: Departmental Budget

NTIS NUMBER: None

PROJECT OBJECTIVE:

To advance the state of knowledge regarding accident proneness theory.

SUMMARY:

The authors took the approach that people do vary in accident proneness, and that there are numerous human factor variables which interact to influence the probability of an individual's being involved in an accident. In addition, some of the sources of variation are transitory whereas others are more persistent, although even the latter vary within subjects over time and across context.

The optimum research paradigm from their standpoint was to view accidents and driving as a problem in systems analysis, in which the driver is one component and variable in a drive-task system. It was noted that such a model would permit one to talk not only of accident-liable drivers, but also of accident-liable vehicles and accident-liable systems. In such a system, certain drivers might be prone to certain types of accidents only under certain conditions. For example, a driver with poor glare recovery might be predisposed only to night accidents on open highways.

Despite the many complexities inherent in person-centered accident liability models, the report noted that differences in proneness have been convincingly demonstrated by many investigators and these differences take on increasing significance under conditions of high exposure (e.g., high mileage, dense traffic, etc.).

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

Not applicable.

SUPPLEMENTARY INFORMATION:

Published in *Accident Proneness*, Shaw, L. and Sichel, H., 197l, 232-236, Pergamon Press.

TITLE: The Development and Evaluation of Accident Countermeasures in Driver Licensing Agencies

AUTHOR(S): Ronald S. Coppin & Raymond C. Peck

DATE: May 1972

REPORT NUMBER: Unnumbered

FUNDING SOURCE: Departmental Budget

NTIS NUMBER: None

PROJECT OBJECTIVE:

To add to the fund of knowledge concerning accident countermeasures.

SUMMARY:

Some conceptual models and designs for developing more efficient licensing programs and driver-oriented accident countermeasures are outlined. The authors point out the futility of seeking a "silver bullet" solution to the highway crash problem. Statistics and studies are cited in the report to show that wholesale removal of the worst drivers (accident and violation repeaters) would have only a limited impact on the total accident problem. Emphasis is placed on the need for sound evaluation procedures including detailed conceptual analyses, randomized treatment assignment, control groups, very large sample sizes, and valid criterion measures. The report recommends

a cost-benefit approach to program development and countermeasure allocation, and notes that a program which saves (through accident prevention) more than it costs should be retained, even if it has only a minor impact on the "total accident problem."

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
Not applicable.

SUPPLEMENTARY INFORMATION:
Published in *Proceedings, International Vehicle and Highway Safety Conference*, Washington, DC, May 30 through June 2, 1972, pp. 95-l04 and in *Journal of Traffic Safety Education*, *20*(3), 1973.

TITLE: Measuring Attitudinal Response to Several Types of Driver Improvement Techniques

AUTHOR(S): Ronald R. Payne

DATE: November 1972

FUNDING SOURCE: None

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:
To develop a quantified evaluation system for measuring subject-oriented psychological differences in response to treatment techniques.

SUMMARY:
A 5% random sample of questionnaires from treatment groups 3-9 in Marsh's 1971 study (Report #36) was selected. These questionnaires related to attitudinal responses to the various treatment methods used in the Marsh study. A system was then developed for reliably coding and scaling the information. The treatments were shown to produce different responses to the scaled question items on six subject-oriented psychological variables, but no association was found between subsequent driving performance and questionnaire responses clustered into dimensions.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
None.

SUPPLEMENTARY INFORMATION:
Master's Thesis, California State University, Sacramento, 1969.

TITLE: The Prediction of Accident Liability Through Biographical Data and Psychometric Tests

AUTHOR(S): Richard M. Harano, Robin S. McBride, & Raymond C. Peck

DATE: March l973

REPORT NUMBER: 39

FUNDING SOURCE: Federal Highway Administration

NTIS NUMBER: PB-220369

PROJECT OBJECTIVE:

To evaluate the role of human factors in traffic accidents.

SUMMARY:

A highly contrasted sample of accident-involved and accident-free drivers was evaluated in order to determine factors related to accident involvement. Collected information represented biographical and driving-related data, personality traits and attitudes, parental relationships, perceptual style, perceptual-motor coordination, and driving simulator performance. For males, the final construct sample multiple regression equation for predicting accident-group membership resulted in a multiple *R* of .69, which subsequently shrank to an *R* of .48 upon cross-validation. The concurrent prediction equation correctly classified 68.9% of the accident-free drivers and 7l.2% of the accident-involved drivers, approximately 20% better than chance prediction. The variables which were significant upon cross-validation were marital status, mileage, traffic conviction record, socioeconomic factors, rating of one's driving ability in comparison to that of elderly drivers, and personality and attitudinal factors derived from a psychometric inventory called the CIDAO. None of the vast array of perceptual-motor and simulator performance measures proved significant, although there was some suggestive relationship between simulator speed variability, two psychomotor measures of field dependence, and accidents. Classification of drivers through cluster analytical procedures revealed several high- and low-accident types. The findings indicated that a combination of cluster analyses and multiple regression analyses is a more powerful method than either alone, and that conventional multiple regression procedures can obscure complex relationships. The results for females closely paralleled the findings for males.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

The findings were not considered to be sufficiently positive for the test battery and simulator to be incorporated into departmental programs.

SUPPLEMENTARY INFORMATION:

Published in the *Journal of Safety Research*, *7*(l), 16-52, 1975.

TITLE: Questionnaire Techniques in Traffic Safety Research: A Digest of California Department of Motor Vehicles' Experience

AUTHOR(S): William V. Epperson

DATE: May 1973

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: 43

NTIS NUMBER: PB-223490

PROJECT OBJECTIVE:

To compile experiences concerning phases of studies dealing with questionnaires.

SUMMARY:
This report details experience regarding questionnaire content, contact strategy, response, non-response and non-recipiency rates in California Department of Motor Vehicles' studies using questionnaires as a data-collection tool. The contribution of questionnaires to each of l0 DMV studies is discussed along with the efficiency of various response maximization procedures.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
This document has been used as a reference by the Research & Development staff and other researchers.

SUPPLEMENTARY INFORMATION:
None available.

TITLE: The Prediction of Driving Record Following Driver Improvement Contacts

AUTHOR(S): William C. Marsh & David M. Hubert

DATE: January 1974

REPORT NUMBER: 50

FUNDING SOURCE: Federal Highway Administration

NTIS NUMBER: PB-238687

PROJECT OBJECTIVE:
To construct prediction equations for post-contact driving records based on three data sources—prior driving record, driver questionnaire responses, and driver improvement analyst (DIA) interview information.

SUMMARY:
Two questionnaires were filled out by 13,594 negligent operators attending group meetings or individual hearings—one questionnaire for factual data and one for emotional responses. After each hearing, the DIA completed the questionnaire and made predictions concerning the subject's probability of improvement. Equations predicting post-contact accidents and convictions were constructed based on stepwise multiple regression analyses using half of the sample. Of the accident prediction equations, only the one based solely on prior driver record variables successfully cross-validated. Equations using variables from all three data sources predicted convictions in the cross-validation sample, and two out of the three conviction equations also predicted cross-validation accidents. No significant improvement in accuracy of prediction was made by "tailoring" equations to different contact groups in the construct sample. DIAs, in general, could not predict whether a driver would be accident-involved or accident-free following driver improvement contact. In contrast, most DIAs were able to predict convictions to a slight (but statistically significant) degree.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
The findings were not considered to be sufficiently positive to warrant operational use of the prediction equation.

SUPPLEMENTARY INFORMATION:
None available.

TITLE: The Psychometric Prediction of Negligent Driver Recidivism

AUTHOR(S): Richard M. Harano

DATE: July 1974

FUNDING SOURCE: Federal Highway Administration

REPORT NUMBER: 49

NTIS NUMBER: PB-244497

PROJECT OBJECTIVE:
To determine whether the subsequent driving record of problem drivers could be predicted following a group driver improvement meeting, and to assess the contribution of psychometric and personality test variables in improving prediction.

SUMMARY:
Significant cross-validity coefficients of .11 and .33 were reported for collisions and convictions, respectively. Driver record and criminal record variables were the most influential predictors of subsequent driving record, with psychological variables playing a relatively minor role. A novel study finding was that the multiple regression equation which was generated to predict subsequent convictions predicted subsequent collisions better than the collision equation itself did.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
The psychometric test instrument results did not justify implementation.

SUPPLEMENTARY INFORMATION:
Published in *Journal of Safety Research*, *7*(4), 170-179, 1975.

TITLE: The Effects of Anonymity on Subject Ratings of Driver Improvement Meetings: Questionnaire Response Bias as a Function of Respondent Anonymity

AUTHOR(S): William V. Epperson & Raymond C. Peck

DATE: December 1975

REPORT NUMBER: Unnumbered

FUNDING SOURCE: Departmental Budget

NTIS NUMBER: None

PROJECT OBJECTIVE:
To determine if self-report information by drivers is more candid if collected under anonymous conditions.

SUMMARY:
Six hundred ninety-two California negligent drivers attending either group educational meetings or individual negligent-operator hearings designed to improve driver attitude and performance were compared on four primary criteria to test

whether anonymous responses to questionnaires differed significantly from non-anonymous responses. The questionnaire asked the subjects to rate the quality of their treatment and their attitude toward DMV. Subjects in the group setting did not respond to some questionnaire items as frequently as subjects did in the individual hearings. Contrary to expectations, subjects responding under an anonymous format tended to be less negative in their rating of the experiment and the treatment they received.

Subjects in the group setting emitted shorter responses and more negative responses than did subjects in the individual-hearing setting. There was no interaction between type of session and anonymity, suggesting that anonymity is not a primary factor when collecting the types of information represented in this study. However, the report warned that caution must be exercised in generalizing this finding to other types of information and situations, particularly where the data are of a personal or sensitive nature.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
None.

SUPPLEMENTARY INFORMATION:
Published as Questionnaire Response Bias as a Function of Respondent Anonymity in *Accident Analysis and Prevention*, *9*(4), 249-256, 1977.

TITLE: Longitudinal Study of California Driver Accident Frequencies I: An Exploratory Multivariate Analysis

AUTHOR(S): Karen W. Kwong, Jensen Kuan, & Raymond C. Peck

DATE: June 1976

REPORT NUMBER: 55

FUNDING SOURCE: Federal Highway Administration

NTIS NUMBER: PB-267435/AS

PROJECT OBJECTIVE:
To attempt to develop an optimum accident-prediction system.

SUMMARY:
Detailed driving-record and questionnaire data were collected on a large sample of drivers, including an additional six years of driving record data on the subjects used in the 1964 Driver Record Study (California DMV, Report #20). An exploratory non-concurrent regression analysis (without questionnaire data) on the most recent 3-year accident interval produced a prediction equation with 29 predictor variables and a multiple correlation coefficient of .271. Among the variables which discriminated between accident and non-accident drivers were prior conviction frequencies and prior accidents. Drivers with prior accidents and convictions were more likely to have accidents in subsequent time periods. Two probabilistic models, the simple Poisson and the negative binomial, were employed to fit the observed accident distributions of three non-overlapping 3-year intervals for the same group of drivers, with the best result

obtained by the negative binomial in the last triennium (p>.70). The report also delineates a conceptual framework of the subsequent phases of the entire process of developing a prediction system.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

The data provided by this study have been used for numerous public informational, planning and research purposes. Much of the information in the California Driver Fact Book came from this study and the project also provided norm groups and statistical baseline data used in other research studies.

SUPPLEMENTARY INFORMATION:

See also Peck and Kuan, Report #84.

TITLE: Toward a Dynamic System of Driver Improvement Program Evaluation

AUTHOR(S): Raymond C. Peck

DATE: 1976

FUNDING SOURCE: None

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:

To advance knowledge in the area of program evaluation as it specifically applies to driver improvement.

SUMMARY:

A number of prior driver improvement research studies were reviewed. The evidence indicated that traffic violations are reduced, at least temporarily, by a variety of driver improvement techniques. The evidence for accident reduction was more equivocal, although the report notes that a few relatively well designed studies had reported statistically significant accident reduction. It is argued that the statistical and psychological aspects of accidents prohibit high correlations and large treatment effects. The methodological shortcomings of past driver-improvement research are discussed, and the research design characteristics of an optimum evaluation system are outlined. An evaluation system under construction at that time in California is noted in the paper as fulfilling most of these optimum characteristics, such as built-in experimental replication, randomized treatment assignment, timely on-line computer-generated effectiveness measures, high statistical power, and cost-benefit modeling. One of the major methodological issues in past evaluation efforts is identified as being the handling of drivers who do not show up for, or who do not complete, the treatment. The need for considering the entire treatment program (shows and no-shows combined) as the primary unit of evaluation is stressed.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

An evaluation system meeting the requirements set out in this paper (the Post Licensing Control Reporting and Evaluation System, or PLCRES), was implemented in California in February, 1975. Annual status reports were produced for departmental management and the Legislative Analyst. PLCRES was replaced by the Negligent-Operator Treatment Evaluation System (NOTES) in 1985. NOTES produced

annual cost-effectiveness reports from 1985 through 1988; in 1990, NOTES reports began being issued biennially.

SUPPLEMENTARY INFORMATION:
Published in *Human Factors*, *18*(5), 493-506 1976.

TITLE: Design and Evaluation of a Crash Prediction Strategy

AUTHOR(S): Edward J. McConnell & Roger E. Hagen

DATE: October 1980

REPORT NUMBER: 76

FUNDING SOURCE: Office of Traffic Safety and National Highway Traffic Safety Administration

NTIS NUMBER: PB81-142671

PROJECT OBJECTIVE:
To define and validate a method of identifying groups of high-risk drivers which yields a more effective crash prediction model than the Department's negligent-operator (neg-op) point system.

SUMMARY:
Based on a 3-year driver record, five high-risk groups were identified from a sample of over 250,000 licensed drivers. These high-risk groups included drivers with various combinations of major and minor traffic convictions. For each of the five groups, a regression equation was derived to maximize the prediction of accident involvement in a future 3-year period. These equations were then cross-validated on an independent sample which met the risk-group definition. The drivers identified as being high-risk by this approach were compared to drivers identified as being high-risk using two alternative regression equations and the neg-op point approach. While the high-risk group approach proved more effective than the neg-op point approach in predicting future accidents, the regression equations using the weighted sum of all convictions and all accidents were even more effective as crash-prediction models. Based on these findings, the authors recommended implementation of a regression equation model using weighted accident and conviction data as the optimal system for selecting high-risk drivers for post-licensing control actions.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
The Department's negligent-operator point system was modified to incorporate some of the recommended improvements. Specifically, some previously noncountable violations were moved to the one-point category and a larger proportion of accidents were assigned points.

SUPPLEMENTARY INFORMATION:
None available.

TITLE: Factors Associated with Fatal Accident Involvement Among California Drivers

AUTHOR(S): Marilee E. Garretson & Raymond C. Peck

DATE: December 1981

REPORT NUMBER: 79

FUNDING SOURCE: Departmental Budget

NTIS NUMBER: PB82-161993

PROJECT OBJECTIVE:

To identify possible factors of fatal accident causation and to isolate common patterns or characteristics for use in developing accident countermeasures.

SUMMARY:

The primary objectives of this study were to examine characteristics of drivers involved in fatal accidents and to determine if those drivers could be distinguished from California's general driving population on the basis of prior driving record. A sample of drivers involved in 1970-71 fatal accidents was analyzed and compared to a sample of drivers from the general driving population licensed during the same time period. The accident-group analyses indicated moderate ability to identify fatal accident types (e.g., alcohol-related vs. nonalcohol, night vs. day) that could be differentiated on the basis of the driver's prior characteristics. Specifically, drivers who had been drinking prior to the accident, who were considered "at fault" for the accident, or whose accident occurred at night were found to have worse prior driving records than other fatal accident-involved drivers. The results also indicated that, as a group, drivers involved in fatal accidents evidenced worse violation and/or accident records than drivers in the general population, as well as different demographic and license characteristics. However, the classification functions derived to predict fatal accidents did not differ greatly from regression equations that have been constructed to predict total accidents. It was therefore concluded that prediction systems keyed to total accidents will, to a large extent, also identify drivers who have a high risk of having a fatal accident.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

The results were generally supportive of the Department's criteria for identifying and acting against high-risk drivers. No changes have been implemented to date.

SUPPLEMENTARY INFORMATION:

This report was also published, in a slightly revised form, in *Journal of Safety Research*, *13*(4), 141-156, 1982.

TITLE: A Statistical Model of Individual Accident Risk Prediction Using Driver Record, Territory and Other Biographical Factors

AUTHOR(S): Raymond C. Peck & Jensen Kuan

DATE: June 1982

REPORT NUMBER: 84

FUNDING SOURCE: Departmental Budget

NTIS NUMBER: PB83-139774

PROJECT OBJECTIVE:

To determine (1) the relative importance of territory, prior driving record, and other variables in predicting future accident involvement; and (2) whether a driver's area of residence is a fair and actuarially sound rating factor.

SUMMARY:

This report is a revised version of a chapter of a report prepared in 1979 as part of the California Department of Insurance Study pursuant to Assembly Concurrent Resolution 100. Starting with two separate random samples totaling more than 90,000 drivers, various prediction models were developed using multiple regression techniques to predict subsequent three-year accident involvement frequency. Although both territory and prior driving record proved to have some validity in predicting a driver's accident risk, the accuracy of prediction was low, with multiple correlations ranging from .08 to .25. Prior driving record, particularly a driver's number of previous traffic convictions, was a much better predictor than territory.

Although absence of accident-cost (insurance-loss) information precluded precise validation of insurance rate-setting practices, it was concluded that both territory and prior driving record appear justifiable as rate-setting factors. However, it was noted that the relatively small unique predictive contribution of territory suggests that territory may be less important than previously believed.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

A number of recommendations based on the findings obtained by the prior version of the study were presented in the ACR 100 Final Report. It was concluded that territory and prior driving record should be retained as rate-setting factors, although not necessarily in the manner and with the weights used by most insurance companies.

SUPPLEMENTARY INFORMATION:

A summary of this paper was presented at the 1982 Annual Meeting of the Transportation Research Board, Washington, DC (Peck, R. C., *California Driving Performance Risk Assessment Study*, Conference Session 115, January 19, 1982.)

Peck, R. C. & Kuan, J. (1983). A statistical model of individual accident risk prediction using driver record, territory and other biographical factors. *Accident Analysis and Prevention*, *15*(5), 371-393.

A summary of the study is also contained in *Proceedings on the Symposium on Traffic Safety Effectiveness (Impact) Evaluation Projects*, Third Annual Symposium, NHTSA and NSC, Chicago, Illinois, May 16-18, 1983.

TITLE: The California Driver Licensing System: A Nontechnical Overview

AUTHOR(S): Mary Janke

DATE: September 1986

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:

To describe the California driver licensing system, relating research findings to licensing and postlicensing control policies.

SUMMARY:

This is an extensive, but nontechnical, review of the literature on such topics as driver training, testing for driver competency, licensing commercial drivers, programs eliminating renewal testing, postlicensing control, the use of the point count in predicting accidents, postlicensing treatment and training, the effectiveness of license action, physically or mentally impaired drivers, and alternatives to the present system. The paper concludes that, from a systems perspective, the role of DMV is best viewed as an example of risk management. A risk management model of driver control is presented.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

Not applicable.

SUPPLEMENTARY INFORMATION:

None.

TITLE: Epidemiologic Perspectives on Drunk Driving

AUTHOR(S): M. W. Perrine, Vermont Alcohol Research Center; R. C. Peck, Department of Motor Vehicles; J. C. Fell, National Highway Traffic Safety Administration

DATE: September 1986

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

FUNDING SOURCE: Office of Traffic Safety

PROJECT OBJECTIVE:

To provide an integrated synthesis of the drunk driving literature from the perspectives of both public health and public safety.

SUMMARY:

This paper presents an overview of the epidemiology of drunk driving and alcohol-related crashes. The role of alcohol in crashes and increased safety risk is discussed in detail. The paper also includes an in-depth review of literature on convicted DUI offenders and offender typologies, including a comprehensive presentation of the work contained in Arstein-Kerslake and Peck, Report #100. The paper concludes with a list of recommended DUI countermeasures and a proposed research agenda.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

Unknown.

SUPPLEMENTARY INFORMATION:
This paper was prepared for The Surgeon General's Workshop on Drunk Driving, December 14-16, 1988. It was subsequently published as a monograph, with the same title and authors, in *Surgeon General's Workshop on Drunk Driving: Background Papers*, December 1988, Washington, D.C.

TITLE: Marijuana and Alcohol: A Driver Performance Study

AUTHOR(S): Alfred A. Biasotti,
Patrice N. Boland,
Calvin Mallory,
Victor C. Reeve, DOJ, &
Raymond C. Peck, DMV

DATE: September 1986

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

FUNDING SOURCE: Office of Traffic Safety

PROJECT OBJECTIVE:
To determine the effects of marijuana, and marijuana in combination with alcohol, on driving performance.

SUMMARY:
In a double-blind experiment, approximately 100 volunteer male marijuana and alcohol users received one of four experimental treatments: (1) marijuana and placebo alcohol, (2) active alcohol and placebo marijuana, (3) active marijuana and alcohol, or (4) double placebo. After consumption, each subject drove a vehicle over a test course which simulated a number of real-world driving conditions, and then performed a series of ancillary tests, including a battery of CHP field sobriety tests and other measures of psychomotor performance, which have been shown to be associated with an increased traffic accident risk.

Four post-drug runs were evaluated, separated by one-hour intervals. The subjects' performance was independently rated by an in-car examiner, outside observers, and computerized vehicle measurements. Blood and urine specimens were extracted after each run to establish levels of THC, serum carboxy, and alcohol.

Through a variety of multivariate statistical techniques it was found that both marijuana and alcohol had significant effects on driving performance, with particularly detrimental effects under the both-drugs treatment. The effects of the both-drugs treatment were found to be primarily additive. The both-drugs group produced the largest performance decrement on all ancillary measures, with a significantly lengthened duration of impairment over that for alcohol or marijuana alone. The effects of marijuana were more rapid than those of alcohol and somewhat less severe for most tasks. Although conclusions about the effect of marijuana alone on safety performance might be guarded, the report notes, the results strongly imply that the combination of marijuana and alcohol increases accident risk. It was concluded that while it could not be deduced from this study that marijuana-impaired driving causes accidents, the consistent additive effects of alcohol and marijuana on a wide array of performance measures implies that marijuana in this context increases accident risk.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
Not applicable.

SUPPLEMENTARY INFORMATION:
A report summarizing some preliminary results was presented at the *Ninth International Conference on Alcohol, Drugs, and Traffic Safety*, San Juan, Puerto Rico, November 17, 1983, and was published in the conference Proceedings.

A condensation of this report was published by Peck, R. C., Biasotti, A., Boland, P. N., Mallory, C., and Reeve V. (1986). The effects of marijuana and alcohol on actual driving performance. *Alcohol, Drugs and Driving*, *2*(3-4), 135-154.

A summary of toxicological findings obtained from this study was published by Hanson, V., Buonarati, M., Baselt, R., Wade, N., Yep, C., Biasotti, A., Reeve, V., Wong, A. and Orbanowsky, M. (1983), Comparison of 3H and 125I radio immunoassay and gas chromatography/mass spectrometry for the determination of delta-9-tetrahydrocannabinoids in blood and serum, *Journal of Analytical Toxicology*, *7*, 96-102.

TITLE: Strategies for Increasing the Traffic Safety Potential of the Negligent Operator Point System

AUTHOR(S): Mary Janke, Jensen Kuan, & Raymond Peck

DATE: October 1987

REPORT NUMBER: Unnumbered

FUNDING SOURCE: Departmental Budget

NTIS NUMBER: None

PROJECT OBJECTIVE:
To explore and evaluate several strategies for identifying high-risk drivers based upon different definitions of negligent-operator point count.

SUMMARY:
Tables are presented showing subsequent accident rates as a function of negligent operator point count, defined in various ways, and the percentages of California drivers within each point-count category under each definition. Results of these tabulations indicated that defining the negligent-operator point count as the totality of all countable and noncountable convictions plus accidents identified twice as many high-risk drivers as did the definition based only on countable conviction points. In addition, the report concludes that there is empirical evidence substantiating the validity of California Vehicle Code Section 12810 (determination of violator point count) and supporting the Department's policy of applying license control actions and accident countermeasures to drivers with elevated point counts.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

Findings provided support for prior decisions to decrease the point level for initiating negligent operator actions and to increase the number of traffic violations that are assigned points.

SUPPLEMENTARY INFORMATION:

See Gebers and Peck, Report #114, and published as "Statistical Methods for Traffic Accident Research" by Kuan, Peck, & Janke in the *Proceedings of the 1990 International Statistical Symposium*, Taipei, Republic of China.

TITLE: Basic California Traffic Conviction and Accident Record Facts

AUTHOR(S): Michael A. Gebers & Raymond C. Peck

DATE: December 1987

REPORT NUMBER: 114

FUNDING SOURCE: Departmental Budget

NTIS NUMBER: PB88-190616

PROJECT OBJECTIVE:

To provide traffic safety administrators with information for developing program and policy decisions, and to provide information to the insurance industry and to scholars and researchers in traffic safety.

SUMMARY:

The report contains information in five areas: (1) the prediction of accident risk, (2) driving record in relation to gender, (3) the accident-repeater phenomenon, (4) the relationship between accident and conviction frequencies, and (5) strategies for targeting high-risk drivers. The study confirmed prior findings from the California Driver Record Study series on the relationship between accident risk and prior driving record. The report points out that accident risk increases fairly linearly as a function of prior accidents and prior convictions on a driver's record, but the correlations are too low for accurate individual prediction. The relationships are sufficient, however, to identify groups of drivers who represent substantially increased accident risk.

The report was, in part, designed to replace the California Driver Fact Book (5th edition), last revised in April, 1981.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

Not applicable.

SUPPLEMENTARY INFORMATION:

Results of this study have been used by insurance companies in establishing and justifying underwriting and rating practices. They have also been used by policy holders in appeals before the Insurance Commission in the state of Maryland. (See California Department of Motor Vehicles [1972-1996], *Research Notes*, Summer 1990, p. 4., Research Chief interviewed for Inside Edition.)

TITLE: Prediction of Driving Record following Two Major Convictions or Three Alcohol-Related Incidents

AUTHORS: William C. Marsh

DATE: October 1989

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: 124

NTIS NUMBER: None

PROJECT OBJECTIVES:

To identify high-risk subgroups of drivers having two major convictions or three alcohol-related incidents.

SUMMARY:

Part I: Identifying High-Risk Subgroups among **316** and **317** Drivers

The Negligent-Operator Treatment Evaluation System (NOTES) is, at the time of writing, an ongoing system to evaluate the effectiveness of the negligent-operator (neg-op) program in California. Drivers with specific types of entries in a 3-year period were eligible for negligent-operator actions which were classified as level 3 alcohol treatment in NOTES:

- reason code **316** actions—two major convictions
- reason code **317** actions—three alcohol-related incidents

Samples of NOTES drivers eligible for **316** and **317** actions were identified. Drivers whose driver record met the 1-year or 3-year neg-op point criterion were excluded from this study. Discriminant analysis was used to develop equations to predict involvement in posttreatment accidents and alcohol-related (A/D) incidents separately for **316** and **317** drivers.

The accident prediction equations were used to divide **316** drivers and **317** drivers into three subgroups, each of which had markedly different accident rates within the **316** and **317** groups. For **317** drivers the accident prediction equation also predicted involvement in A/D incidents about as well as an equation specifically developed to predict these incidents. For **316** drivers the accident prediction equation performed poorly in predicting involvement in A/D incidents, compared to the A/D incident prediction equation.

Part II: Examining the Potential Contribution of BAC level to the Identification of High-Risk Subgroups.

BAC level was thought to be an important predictor of future accident involvement for drivers convicted of DUI. BAC information was not present in the NOTES data. BAC information was available in the data collected for an in-progress study of the DUI Offender Tracking System (DOTS). The DOTS study sample was composed of drivers with DUI convictions during the first half of 1984. Samples of first-time DUI offenders and second offenders were selected from the DOTS study sample.

Only 40% of first offenders and less than 38% of second offenders had BAC data available. For both first and second offenders there was an inverse relationship between BAC and total subsequent accidents (i.e., high BAC levels were associated with having lower subsequent accident rates). For both first and second offenders there was a direct relationship between BAC and subsequent A/D incidents (i.e., high BAC levels were associated with having more such incidents in the future).

The report recommended the following:

- In the event that the Department decided that some form of **316/317** intervention was desirable, then a three-tier approach was proposed, such that

  (1) The groups of drivers having the lowest accident prediction scores should be left untreated.

  (2) Groups having intermediate scores should be treated with a low-cost intervention (such as a mailed self-study brochure).

  (3) The Department should reserve the relatively high-cost in-person contacts (hearings or reexaminations) for the groups with the highest accident prediction scores.

- Any treatment program used with **316** and **317** drivers should be evaluated through NOTES, and an increased percentage of these drivers should be assigned to the NOTES control group.

- For the present, BAC level should not be used to assign **316** and **317** drivers to treatment. Before considering BAC for this use in the future, the Department should undertake a study of the relationship between BAC and accidents in the **316** and **317** populations.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

The Department decided to accept the recommendation found in NOTES reports #2, #3 and #4 to discontinue the **316/317** treatment program. Therefore, the recommendations of this study were no longer relevant.

SUPPLEMENTARY INFORMATION:

See Marowitz, Reports #161 and #164, for a much larger scale study on the relationship between BAC level and subsequent DUI recidivism.

TITLE: The General and Specific Deterrent Effects of DUI Sanctions: A Review of California's Experience

AUTHOR(S): Raymond C. Peck

DATE: May 1990

FUNDING SOURCE: Partial support from UCLA Brain Information Service

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:
To provide an overview of the findings and policy implications of departmental studies on drunk driving.

SUMMARY:
This paper presents an overview of California Department of Motor Vehicles research studies on DUI recidivism correlates and the specific and general deterrent effects of various DUI countermeasures, particularly license control actions and alcohol rehabilitation programs. Several studies published between 1976 and 1989 are reviewed, along with an analysis of previously unpublished data collected and analyzed specifically for this paper. The paper concludes that license suspension is effective in reducing recidivism and accidents during the period of suspension, but that extensive alcohol rehabilitation programs may be slightly superior in reducing alcohol-specific offenses. It also states that there is strong evidence to show that California's 1982 DUI laws and the formation of MADD have been effective in reducing DUI-related accidents and in lowering the rate of recidivism among convicted DUI offenders.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
Not applicable.

SUPPLEMENTARY INFORMATION:
Paper presented at International Symposium, Santa Monica, California, May 11-13, 1990.

Proceedings published in *Alcohol, Drugs and Driving*, 7(1), 13-42, 1991.

TITLE: Traffic Conviction- and Accident-Record Facts

AUTHOR(S): Michael A. Gebers

DATE: October 1990

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: 127

NTIS NUMBER: PB91-172387

PROJECT OBJECTIVE:
To provide highway safety administrators, insurance industry representatives, and researchers in the field of traffic safety with information for developing program and policy decisions.

SUMMARY:
This report is an update of a study by Gebers and Peck (Report #114, 1987) and focuses on the prediction of accident risk. The study complements *Teen and Senior Drivers* (Romanowicz & Gebers, Report #126, 1990), which focuses on factors of driver mileage and age. Specifically, this report addresses four areas related to the assessment of traffic accident risk: (1) driver record in relation to gender, (2) the accident-repeater phenomenon, (3) the relationship between accident and conviction frequencies, and (4) strategies for targeting high-risk drivers. Prior findings from the California Driver Record Study series on the relationship between subsequent accident risk and prior

driving record were confirmed. The report points out that accident risk increases fairly linearly as a function of prior accidents and prior convictions on a driver record, but the correlations are too low for accurate individual prediction. The relationships are sufficient, however, to identify groups of drivers who represent substantially increased accident risk.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
Not applicable—findings provided continued support for the departmental policy of using neg-op points to trigger driver control actions.

SUPPLEMENTARY INFORMATION:
None.

TITLE: Accident Reporting: Is There a Problem?

AUTHOR(S): Mary K. Janke & Raymond C. Peck

DATE: January 1991

REPORT NUMBER: Unnumbered

FUNDING SOURCE: Departmental Budget

NTIS NUMBER: None

PROJECT OBJECTIVE:
To evaluate the effect of nonreporting of accidents on the utility of California Department of Motor Vehicles' driver record database.

SUMMARY:
This paper reviews evidence on the magnitude of nonreporting of accidents in California. The study assesses alternatives for increasing reporting levels and also reviews historical variations in various traffic conviction and accident parameters reported in statistical studies published between 1954-1990. It is concluded that most studies have not been invalidated by nonreporting and that historical changes have been relatively negligible.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
Not applicable.

SUPPLEMENTARY INFORMATION:
None.

TITLE: Traffic Violation Patterns and Age

AUTHOR(S): Michael A. Gebers

DATE: June 1991

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: 126b

NTIS NUMBER: None

PROJECT OBJECTIVE:
To examine the rates of different violation types as a function of age, and the pattern of violation types within each age group.

SUMMARY:
Past studies have established that driver age and sex are both related to driving record (e.g., Gebers, 1990; Romanowicz & Gebers, 1990). In these studies, both young and male drivers consistently displayed higher total traffic accident and conviction rates than did drivers who were older or female. These studies have also found that the primary causes of traffic accidents differ for younger and older drivers. It might therefore be expected that the traffic violation pattern would also be different for various age groups. This paper examines the rates of different violation types as a function of age, and the pattern of violation types within each age group.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
None

SUPPLEMENTARY INFORMATION:
See Gebers, Report #127; Romanowicz and Gebers, Report #126; and Gebers, Romanowicz, and McKenzie, Report #141.

TITLE: The Identification of High-Risk Target Groups

AUTHOR(S): Raymond C. Peck

DATE: 1992

FUNDING SOURCE: Partly supported by National Highway Traffic Safety Administration (NHTSA)

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:
To advice the federal government (NHTSA) on traffic safety priorities and risk identification strategy.

SUMMARY:
This paper presents a paradigm for determining accident countermeasure strategies and resource allocation priorities. The paradigm involves the following elements: (1) establishment of permissible risk thresholds; (2) identification of high risk drivers; (3) development of effective countermeasures; (4) delivery system and resource allocation models; and (5) evaluation and management information systems for providing feedback and iterative refinement of safety benefits.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
Some of the components of the model have been used by the California Department of Motor Vehicles in traffic safety policy development.

SUPPLEMENTARY INFORMATION:
Some of the information in this paper was included in a report of the workshop entitled *Target Populations Expert Panel Workshop*, Walcoff and Associates, 1992.

TITLE: The California Driver Record Study: A Multiple Regression Analysis of Driver Record Histories from 1969 through 1982

AUTHOR(S): Raymond C. Peck & Michael A. Gebers

DATE: August 1992

REPORT NUMBER: Unnumbered

FUNDING SOURCE: Departmental Budget

NTIS NUMBER: None

PROJECT OBJECTIVE:

To provide a resource for researchers and statisticians having an interest in driver accident correlates and accident prediction modeling.

SUMMARY:

The paper summarizes the results of a large number of regression analyses of driving record variables measured over several time periods. It was planned to use the results from the analyses to guide the development of models using similar data extracted in 1992 as part of the California Driver Record Study database. Because this latter effort would both include and extend the data set used for these analyses, the paper was limited to a presentation of the various multiple regression equations and a very brief summary of the major highlights.

Data for the analyses were obtained from a 1% random sample of approximately 180,000 licensed California drivers, whose records were extracted during the 1983 update of the California Driver Record Study database. The variables comprising the predictor set represented the majority of potentially relevant driving population parameters contained in California driver record files, and they were chosen to be consistent with variables used in previous California driver record studies. Stepwise multiple regression analysis was used for identifying the combination of variables that provided the most accurate prediction of the criterion measure. For most of these analyses, the criterion measure was an accident frequency variable, but in some of them a traffic conviction variable served as the criterion measure.

The results indicated that total accidents were the most predictable of the accident criterion measures, but the highest multiple *R* (.216) for the nonconurrent data (independent driver record time periods) was still disappointing. The structure of the equations was very similar to that found in prior California studies. It was recommended that planned future studies explore a number of techniques for increasing predictive accuracy, including lengthening the criterion interval beyond 5 years.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

Not applicable. The results are being used in directing subsequent model development efforts.

SUPPLEMENTARY INFORMATION:

See Gebers and Peck, Report #144.

TITLE: The Identification of Multiple Accident Correlates in High Risk Drivers with Specific Emphasis on the Role of Age, Experience & Prior Traffic Violation Frequency

AUTHOR(S): Raymond C. Peck

DATE: 1993

FUNDING SOURCE: Partial support of UCLA Brain Information Service

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:

To summarize the state of current knowledge on multiple risk factors among driver accident correlates.

SUMMARY:

This paper reviews a number of studies which have attempted to isolate driver accident risk correlates through multivariate and multiple regression techniques. Rather than evaluating single risk factors, multivariate approaches evaluate the interrelation among multiple risk factors and attempt to establish the relative predictive power of each variable within the context of a larger set of variates. The review is limited to studies of general (non-commercial) driver populations.

It is shown that no single variable, or set of variables, can accurately predict the subsequent accident involvement rates of individual drivers. This limitation is largely due to the stochastic nature of traffic accidents. However, a large number of driver characteristics affect the likelihood of a driver's accident involvement, and these relationships can be used to make actuarial predictions. Among the most consistent predictors of increased risk are: a prior history of accidents and traffic convictions; being young; being male; being inexperienced; being from a lower socioeconomic status (SES) background; increased exposure (e.g., high mileage); poor social adjustment (e.g., poor school performance, criminality, family disorganization); and certain attitudinal and personality traits. A hypothetical schema is presented for integrating the preceding relationships into a comprehensive explanatory model.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

Not applicable.

SUPPLEMENTARY INFORMATION:

This paper was presented at the annual International Symposium on Alcohol, Drugs and Driving, Santa Monica, California, May 6-9, 1993. It was subsequently published in *Alcohol, Drugs and Driving*, *9*(3-4), 145-166, 1993.

TITLE: Strengths and Limitations of Accident Data in a Drivers License Setting

AUTHOR(S): Raymond C. Peck

DATE: 1993

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:

To elucidate for the transportation research community the importance and limitations of using accident data in making driver licensing decisions.

SUMMARY:

Although the use of accident data and driver accident rates often cannot be avoided in evaluating driver license programs, they do suffer from a variety of limitations. Most of these relate to their stochastic nature and relative infrequency, which make them insensitive measures of actual driving behavior.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

Not applicable.

SUPPLEMENTARY INFORMATION:

This paper was presented at the *1993 Annual Conference of the Transportation Research Board*, January 12, 1993, Washington D.C.

TITLE: New Technology for an Old Problem: A Report on a Prospective Study to Evaluate a Simulator-Based Approach to Driver Licensing

AUTHOR(S): Raymond C. Peck & J. Wachtel

DATE: January 1993

REPORT NUMBER: Unnumbered

FUNDING SOURCE: Departmental Budget (partially)

NTIS NUMBER: None

PROJECT OBJECTIVE:

To develop and present a cooperative strategy and research design for evaluating the use of the Atari Games Corporation (AGC) interactive simulator as an adjunct to traditional driver license road testing.

SUMMARY:

The report summarizes the drive task components to be included in constructing simulated driving scenarios, and the response modalities captured by the simulator. The paper also presents a research design for evaluating: (1) relationship between simulator performance and road tests; (2) relationship between simulator performance and accident rates; and (3) relationship between the preceding within age groups.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

The simulator is still under development, which has been delayed by numerous technical problems and corporate priority shifts and changes in ownership. The simulator and related patents were acquired by Doron in 1996.

SUPPLEMENTARY INFORMATION:

This paper was presented at the *1993 Annual Conference of the Transportation Research Board*, January 12, 1993, Washington D.C.

ITLE: Quantifying the Net Accident Contribution of Convicted DUI Repeaters: Some Methodological Issues and Preliminary Findings

AUTHOR(S): Raymond C. Peck

DATE: January 10, 1994

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:

To quantify the role of convicted DUI offenders as a traffic safety problem.

SUMMARY:

This paper illustrates how an interrelated system of California databases can be used to address a number of substantive research questions and methodological issues related to the accident risk of convicted DUI offenders. Three specific questions were addressed in detail:

1. What is the rate of DUI recidivism as a function of time from previous offense?
2. What is the accident rate of convicted DUI offenders prior and subsequent to DUI conviction?
3. What proportion of total and fatal accidents in a given year could be prevented by effectively removing convicted DUI offenders from the driving population?

The remainder of the paper presents a series of empirical findings and statistical analyses, leading to the following conclusions and observations:

- DUI offenders who recidivate tend to do so within 3 years following their initial offense. Roughly 53% of DUI offenders reoffend within 9 years. Offenders who remain DUI-free for 10 years have subsequent DUI rates that are only moderately higher than those of the general driving population.

- The DUI reoffense hazard function was closely approximated by hazard models in which the proportion who reoffend declines as a linear or logarithmic function of increasing years of DUI-free driving.

- It is important to distinguish between prior, concurrent and subsequent accident risk in estimating the safety risk of convicted DUI offenders. Convicted DUI offenders represent substantial accident risks prior to being convicted of a DUI

offense but are only moderately over involved during subsequent time periods. This reduction in accident risks over time is largely attributable to the sanctions following the initial conviction, which include fine, jail, alcohol rehabilitation treatment and license suspension.

- Removing or somehow rendering "accident proof" all convicted DUI offenders would have only a modest effect in preventing subsequent accidents. For example, if all drivers (4%) with 1 or more DUI offenses in the previous 5 years were removed from the California driving stream, there would be only 7.2% fewer accidents in the subsequent one-year period.

- The proportion of convicted DUI offenders who recidivate and their role in fatal accidents is inextricably tied to each state's level of enforcement, record-quality and document retention policies. As such, comparisons between states and the very nature of the parameters being estimated are subject to a variety of artifacts.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
Not applicable.

SUPPLEMENTARY INFORMATION:
This paper was sponsored by the Committee on Alcohol, Other Drugs & Transportation. It was presented at the *1994 Annual Meeting of the Transportation Research Board* and a summary was published in *Transportation Research Board Circular* #358.

TITLE: Evaluating DUI Program Impact in Quasi Experiments

AUTHOR(S): Raymond C. Peck

DATE: July - December, 1994

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:
To increase awareness of the need for rigorous research designs in evaluating DUI intervention programs and to present examples where quasi experiments have produced relatively equivocal results.

SUMMARY:
This paper reviews the limitations of quasi-experimental evaluation procedures commonly used in assessing DUI educational and remediation treatment programs. Although conventional designs for removing bias are usually flawed, examples are cited where relatively unequivocal inferences can be reached regarding the presence or absence of a positive treatment effect. In general, it is argued that randomized experimental designs are superior to quasi-experiments and should be used much more extensively than has been the case.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
Not applicable.

SUPPLEMENTARY INFORMATION:

This paper was presented at the *International Conference on DUI Education and Prevention*, Santa Monica, May 13-15, 1994. It was subsequently published in *Alcohol, Drugs & Driving*, *10*(3-4), 207-215, 1994.

TITLE: An Inventory of California Driver Accident Risk Factors

AUTHOR(S): Michael A. Gebers &
Raymond C. Peck

DATE: August 1994

REPORT NUMBER: 144

FUNDING SOURCE: Departmental Budget

NTIS NUMBER: None

PROJECT OBJECTIVE:

To provide highway safety administrators, insurance industry representatives, and researchers in the field of traffic safety with information for developing program and policy decisions.

SUMMARY:

This report presents driver record information on a random sample of over 200,000 California drivers and driver record histories covering 12 years of driving. The report addresses the following issues related to the assessment of traffic accident risk:

- Driver record in relation to gender and age.
- Accident–repeater phenomenon.
- Relationship between traffic accidents and citations.
- Relationship between traffic accidents and multiple driver record variables (e.g., prior accidents and citations, sex, and license class).
- Multiple regression and logistic regression equation of accident risk factors and relativities.

Findings presented in the report confirmed that prior total citation frequency continues to be the most significant predictor of accident involvement, followed by prior accident involvement frequency. Increased accident involvement was shown to be associated with increased prior citation and accident frequencies, possessing a commercial driver license, being young, being male, having a medical condition on record, and having a physician referral for low visual-acuity on record.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

Not applicable—findings provided continued support for the departmental policy of using neg-op points to trigger driver control actions.

SUPPLEMENTARY INFORMATION:

See Gebers, Report #127; Gebers, Romanowicz, and McKenzie, Report #141; and Peck and Gebers, Report #144 (Note: This report is copyrighted and can be purchased for $50.00 per copy.)

TITLE: Comment on Mannering's "Male and Female Driver Characteristics and Accident Issue: Some New Evidence." Also Rejoinder to Mannering

AUTHOR(S): Raymond C. Peck

DATE: 1994 & 1995

FUNDING SOURCE: Not applicable

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:

To alert the traffic safety research community of some conceptual errors and methodological limitations in a published paper by Fred Mannering.

SUMMARY:

A paper by Mannering published in *Accident Analyses and Prevention* (1993) suggested that gender and prior accident frequency were not related to future accident risk. Peck (1994 & 1995) identified a number of limitations in Mannering's paper and cautioned against accepting the author's conclusions.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

Not applicable.

SUPPLEMENTARY INFORMATION:

This document was published in: *Accident Analyses and Prevention*, *26*(1), 130-131, 1994 and the author's rebuttal on pages 132-133. The Rejoinder to Mannering by R. C. Peck was published in *Accident Analyses and Prevention*, *27*(4), 618-620, 1995.

TITLE: Review of H. W. Robbe's Book "Influence of Marijuana on Driving"

AUTHOR(S): Raymond C. Peck

DATE: April-June 1995

FUNDING SOURCE: Not applicable

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:

To apprise the scientific community of the strengths and limitations of an important work on marijuana's effect on driving.

SUMMARY:

The book by Robbe presents results of a series of experiments in which volunteers were given various doses of marijuana and asked to perform a variety of tasks, including driving on a drive range and in actual traffic. The review is very positive but does point out some limitations in the study. The results suggest that marijuana has relatively moderate detrimental effects on driving behavior which, at the dosage levels normally consumed by marijuana users, are equivalent in severity to blood alcohol levels of .05% – .07%.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
Not applicable.

SUPPLEMENTARY INFORMATION:
This book review was published in the *Journal of Psychoactive Drugs*, *27*(2), 187-191, April-June 1995.

TITLE: DUI Educational and Rehabilitation Program Effectiveness–A Review of California Experience

AUTHOR(S): Raymond C. Peck

DATE: 1996

FUNDING SOURCE: Partial support - University of New Mexico, Institute for Social Research

REPORT NUMBER: Unnumbered

NTIS NUMBER: None

PROJECT OBJECTIVE:
To review the California research evidence on the relative effectiveness of DUI treatment programs, and to present an overview for traffic safety practitioners and policymakers in New Mexico.

SUMMARY:
This paper describes the historical evolution of DUI treatment and sanction programs in California between 1976-1996. Recidivism has declined over this period due in part to the increased use of license suspension combined with DUI educational and alcohol treatment programs.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
Not applicable.

SUPPLEMENTARY INFORMATION:
This paper was presented on 4/1/96 in Albuquerque and Santa Fe as part of a guest lecturer tutorial program coordinated by the Institute for Social Research, University of New Mexico.

TITLE: Exploratory Multivariable Analyses of California Driver Record Accident Rates

AUTHOR(S): Michael A. Gebers

DATE: May 1997

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: 166

NTIS NUMBER: PB98-100969

PROJECT OBJECTIVE:
To compare the results obtained from several different multiple regression techniques under consideration for use in the California Driver Record Study.

SUMMARY:
Since 1964, the California Department of Motor Vehicles has issued several monographs on driver characteristics and accident risk factors as part of a series of analyses known as the California Driver Record Study. This paper presents the results of a number of regression analyses of driving record variables measured over a 6-year time period (1986-1991). The techniques presented consist of ordinary least squares, weighted least squares, Poisson, negative binomial, linear probability, and logistic regression models.

The results are informative in determining whether the various regression methods produce similar results for different sample sizes and to explore whether reliance on ordinary least squares techniques in past California Driver Record Study analyses have produced biased significance levels and parameter estimates.

The results indicate that, for these data, the use of the different regression techniques do not lead to any greater increase in individual accident prediction beyond that obtained through application of ordinary least squares regression. In addition, the methods produce almost identical results in terms of the relative importance and statistical significance of the independent variables. It therefore appears safe to employ ordinary least squares multiple regression techniques on driver accident-count distributions of the type represented by California driver records, at least when the sample sizes are large.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
Not applicable.

SUPPLEMENTARY INFORMATION:
This paper was presented at the *1998 Annual Meeting of the Transportation Research Board* and at the *1998 Annual Meeting of the Sacramento Statistical Association*. The paper was subsequently published in the *Transportation Research Record*, No. 1635, pp. 72-80.

TITLE: Strategies for Estimating Driver Accident Risk in Relation to California's Negligent-Operator Point System

AUTHOR(S): Michael A. Gebers

DATE: July 1999

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: 183

NTIS NUMBER: PB2000-103237

PROJECT OBJECTIVE:
To assess the accuracy of predicting future accident risk using various combinations of demographic and prior driving record variables as predictors.

SUMMARY:

A sample of approximately 140,000 records of licensed California drivers containing information on age, gender, and driving record variables was examined. The goal of this paper was to assess the accuracy of predicting future accident risk using various combinations of demographic and prior driving record variables as predictors in 17 regression models.

All of the models were consistent in demonstrating that increased probability of subsequent accident involvement is associated with increased prior citation and prior accident frequencies, being young, and being male. Results from the regression models indicated the following:

- Models that use prior total accidents as a predictor variable perform better than models that do not use prior total accidents as predictors.
- Models that use prior culpable accidents as a predictor do not perform as well as models that use prior total accidents as a predictor.
- A comparison of models in which 17 individual violation types are used as predictors to those in which only total citations is used as a predictor shows only a small advantage of using individual violation types.
- Models that use as predictors the demographic variables of age, gender, and license class along with various combinations of citations and accidents perform better than California's current neg-op system, which uses a weighted combination of countable citations and responsible accidents.

It was concluded that if the goal of driver record adjudication systems is to identify and apply sanctions to high-risk drivers in order to intervene before this risk is realized, then the results presented in this report support the current point-count strategy which attempts to optimize the identification of drivers having a high probability of subsequent accident involvement.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

Not applicable.

SUPPLEMENTARY INFORMATION:

Not applicable.

TITLE: Development of a Conceptual Integrated Traffic Safety Problem Identification Database

AUTHOR(S): Paul Choate

DATE: December 1999

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: 186

NTIS NUMBER: PB2000-105042

PROJECT OBJECTIVE: This project conceptualized and evaluated the potential usefulness to users of a prototype information system that would integrate traffic crash-related data collected from the Department of Motor Vehicles Driver License and

Vehicle Registration automated databases, the California Highway Patrol statewide Integrated Traffic Records System, and the National Highway Traffic Safety Administration Fatality Analysis Reporting System. The envisioned system would provide statistical information that will support crash analysis, driver-risk modeling, countermeasure development, and program evaluation studies.

SUMMARY: The project conceptualized a traffic safety risk management information system and statistical database for improved problem-driver identification, countermeasure development, and resource allocation.

The California Department of Motor Vehicles Driver License (DL) and Vehicle Registration (VR) database systems, the California Highway Patrol Statewide Integrated Traffic Records System (SWITRS), and the National Highway Traffic Safety Administration (NHTSA) Fatality Analysis Reporting System (FARS) each provide valuable information on crashes in California for conducting problem identification analyses, developing and evaluating traffic safety programs, and allocating resources. The project explored these four primary systems and investigated several additional data sources suggested by the project advisory committee, including the California Department of Transportation Traffic Accident Surveillance and Analysis System, the Department of Health Services Hospital Discharge Database, and the Department of Justice Criminal Justice Information System.

Based on a review of the existing systems and inputs from a project advisory committee of representatives of leading national and state traffic safety research interests, the department has decided to develop a prototype ITSPID system that would integrate the DL, VR, SWITRS, and FARS databases.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS: The conceptualized system was not put into operation.

SUPPLEMENTARY INFORMATION: None.

TITLE: Medical Conditions and Other Factors in Driver Risk

AUTHOR(S): Mary K. Janke

DATE: May 2001

FUNDING SOURCE: Departmental Budget

REPORT NUMBER: 190

NTIS NUMBER: PB2002-105460

PROJECT OBJECTIVE:

The Brandi Mitock Safe Drivers Act of 2000, named for a young woman pedestrian fatally injured in a collision with an elderly driver, required the Department of Motor Vehicles to evaluate the effects of physical conditions, ailments, and other factors on the ability to drive safely. The department was to include indicators and predictors (including driving record) relating to impairment of this ability, and to consider input from any interested party. The results of the evaluation were to be submitted to the California Legislature by July 15, 2001.

SUMMARY:

This report first addresses general indicators of crash risk. These include a poor driving record in terms of crashes and traffic convictions, being a commercial driver (more driving leads to increased exposure to risk, therefore more incidents), being young, and being male. It then gives crash rates and crash odds ratios for broadly defined groups (P&M groups) of impaired drivers known to the department as having physical or mental conditions that potentially impair driving. (The basis for much of this work was an unpublished 2001 report by Emilie Mitchell and Michael Gebers of DMV R&D.) The present report also discusses mandated physician reporting of "reportable" conditions causing recurrent lapses of consciousness or dementia, and presents departmental guidelines for regulating the driving privilege of drivers with either of these. It reviews the scientific literature dealing with the effect of reportable and non-reportable medical conditions on crash risk. Finally, the report briefly discusses a tiered assessment system under study by the department (the "three-tier") that holds promise for identifying, evaluating, and eventually improving the safety of medically impaired drivers.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

The legislative commitment was fulfilled. The three-tier assessment system is still under study at the time of writing, although a report should be published in mid-2004. Whether the system will be implemented in the form recommended by the authors is unknown as yet. The relevance of three-tier assessment to the specific circumstances of Brandi Mitock's death is that, although the three-tier system provides for administering additional tests to renewal applicants of any age, this testing may be most needed and useful in the case of the oldest and most impaired applicants.

SUPPLEMENTARY INFORMATION: This report was based in part on the following journal publication: Janke, M. (1993). Reportable medical conditions and driver risk. *Alcohol, Drugs and Driving*, *9*, 167-183.

TITLE: Development of a Driver License Application Management Information System

AUTHOR(S): Michael A. Gebers

DATE: January 2002

FUNDING SOURCE: Office of Traffic Safety

REPORT NUMBER: 192

NTIS NUMBER: PB2002-108310

PROJECT OBJECTIVE:

To research a management information system design that will provide descriptive measures and statistical data related to the driver licensing process. If implemented, the system will be able to provide data for study purposes such as evaluation of drivers licensing programs, driver competency, and monitoring of driver licensing operations.

SUMMARY:

This project investigated the possibility of developing a conceptual off-line management information system that would contain selected driver licensing information from the Driver License (DL) Master File and, if feasible, from field office

electronic databases and possibly existing aggregate-level statistical reports. If developed, the database would be reflective of the statewide driver licensing program, containing data on all, or a large random sample of, licensing process activity throughout the state. The proposed database would be able to provide descriptive measures and statistical data related to the driver licensing process.

In the event that departmental management decides to proceed with implementation of the proposed database, funding from the California Office of Traffic Safety would need to be requested and provided for the next stage, Stage II, of the project. The implementation schedule for Stage II is provided in this report. Specifically, Stage II will involve the creation of a prototype DL Application Management Information System Database, which will include collecting actual application data and producing trial information and example statistical reports as a demonstration and validation of the prototype system.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

SUPPLEMENTARY INFORMATION:
The California Office of Traffic Safety has funded Stage II of the project.

TITLE: Department of Motor Vehicles Post-Licensing Control Management Information System Fiscal Year 2000/2001: Administrative Per Se (APS)

AUTHOR(S): Patrice Rogers

DATE: January 2002

FUNDING SOURCE: Departmental Budget and National Highway Traffic Safety Administration

REPORT NUMBER: 193

NTIS NUMBER: None

PROJECT OBJECTIVE:
To provide the Department of Motor Vehicles, police, and forensic laboratories with the empirical information needed to identify and track any further departmental or regional process deficiencies, thereby enabling accurate, rational, and timely operational and policy decisions with respect to subsequent departmental actions.

SUMMARY:
This report resulted from the identified need for ongoing reporting of APS quality trends and processes reported in the 1998 APS set aside process evaluation (Report #175). This report is the first of a series of ongoing reports to provide measures of operational effectiveness of the APS system performance as recommended in that earlier report. It provides an assessment of the quality of the departmental APS system operations. Action summaries and historical trends were obtained from the driver record database related to APS. APS data are presented for each of the first 11 years of the APS program following its 1990 implementation. Most of the information presented in the report is presented in graphical form to provide an easily interpretable visual display showing the level of conformity or changing trends within each process area. These trends should reveal the degree to which the particular Driver Safety processes conform to policy and provide some indication of the extent to which policies themselves are consistent with the intended outcome.

Information is also presented by Driver Safety Region or District Office to indicate the extent to which processes and actions are consistent from one region or office to another and the extent to which process measures improve or degrade over time.

Some of the most noteworthy key findings include:

- Each year roughly 94% of all DUI arrests result in an APS action.
- Repeat offense, and BAC test refusal rates have consistently decreased each year following implementation of APS.
- Set aside commercial driver APS actions have increased in recent years as have overall set aside rates.
- The proportion of hearings resulting in a stay of the action have increased annually with nearly 90% of all APS hearings scheduled in FY 00/01 resulting in a stayed action.
- A high sustain rate for APS departmental reviews and dismissal hearings coupled with the small number of court challenges that result in a ruling to overturn the original hearing or departmental review decision reflect the legal soundness and stability of the overall APS process.
- There were noteworthy differences between the regions in the proportions of hearings held as telephone versus in-person hearings, and in hearing outcomes.
- Arresting agencies in several of the large Southern California counties (including Orange, Riverside, and San Bernardino) and Santa Clara County each performed significantly more blood tests than breath tests for arrested DUI offenders. Their blood to breath testing ratio is proportionately opposite the ratio in all other major counties throughout the state.
- The proportion of DUI offenders with an APS action set aside, but a DUI conviction on record, decreased each year since FY 95/96 indicating recent improvements in departmental process.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:
Findings have lead to a number of refined policies, procedures, and guidelines.

SUPPLEMENTARY INFORMATION:
Results were presented to Regional Managers and HQ Driver Safety staff and in meetings with CHP and Office of traffic Safety.

TITLE: An Examination of the Characteristics and Traffic Risk of Drivers Suspended/Revoked for Different Reasons

AUTHOR(S): Michael A. Gebers & David J. DeYoung

DATE: November 2003

FUNDING SOURCE: Office of Traffic Safety

REPORT NUMBER: 200

NTIS NUMBER: PB2003-104209

PROJECT OBJECTIVE:

This study examined the prior crash and traffic conviction history of drivers suspended/revoked for different reasons, and then compared the relative historical traffic risks of the different suspended/revoked drivers.

SUMMARY:

One measure that has traditionally been used to better control drunk and other high-risk drivers has been to suspend or revoke their privilege to drive. However, because the driving privilege is so highly valued, an increasing number of new laws have been passed which prescribe license suspension/revocation as a punishment for a variety of offenses, including some completely unrelated to driving. This has created a diverse group of suspended/revoked drivers.

Prior research has demonstrated that suspended/revoked drivers pose a significant traffic risk, but until now little has been known about whether, and if so how, this risk varies as a function of the reason for suspension/revocation. This study classifies suspended/revoked drivers into subgroups based on their reason for suspension/revocation, and then develops demographic and driving risk profiles for each group. Separate risk profiles are developed for the following traffic safety indicators, measured 3 years prior to the suspension/revocation action; 1) total crashes, 2) fatal/injury crashes, 3) total traffic convictions, and 4) total incidents (crashes + convictions).

The findings clearly show that: 1) suspended/revoked drivers are a heterogeneous group, both demographically and in their driving behavior; 2) some suspended drivers, such as those suspended/revoked for a non-driving offense, have low traffic risks that are comparable to those of validly-licensed drivers, and; 3) all suspended groups have elevated crash and conviction rates, compared to validly-licensed drivers. The implications of these findings for current laws and policies targeting suspended/revoked drivers are discussed, and recommendations for improving these laws/policies are presented.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

The study recommended that the department's R&D Branch write and submit to the Office of Traffic Safety a grant proposal to develop and convene an interagency committee that would examine and revise the current suspension/revocation laws – this has not yet occurred.

SUPPLEMENTARY INFORMATION:

This study is In Press with the Journal of Safety Research (expected publication date 2004).

TITLE: Development and Evaluation of a Risk Management Strategy for Reducing Crash Risk

AUTHOR(S): Michael A. Gebers & Raymond C. Peck

DATE: March 2003

FUNDING SOURCE: Office of Traffic Safety REPORT NUMBER: 202

NTIS NUMBER: PB2004-101494

PROJECT OBJECTIVE:

To develop a strategy for maximizing the number of traffic crashes prevented by tailoring educational, rehabilitative, and license control interventions to identifiable high-risk problem driver groups.

SUMMARY:

Regression models were applied to a random sample of licensed California drivers with the objective of identifying groups of drivers with elevated risks of being involved in future traffic crashes. The driving records of the risk groups identified from the models were examined to identify drivers not receiving any form of driver improvement or license control actions. The risk levels of these identified "untreated" drivers were compared with negligent operators who have received licensing actions to determine how existing discretionary and mandatory actions correlate with traffic safety risk. The defining characteristics of high-risk drivers escaping driver improvement or license control actions were examined in an attempt to construct a recommended set of countermeasures. The potential utility of these countermeasures in terms of crash reduction and benefit-cost ratios was estimated based on prior research evidence and mathematical simulation.

In examining the defining characteristics of high-risk groups that currently escape driver improvement interventions, the majority was characterized either by traffic violator school (TVS) dismissals, citations, or crashes. These elements often combine with each other and with other risk factors to increase crash risk beyond that of drivers who meet the state's *prima facie* definition of a "negligent operator."

It is noted that there are two fundamental considerations for constructing a countermeasure system: (1) the countermeasures must be economically and operationally feasible, and (2) they must be legally permissible. Therefore, this study recommends interventions involving minimal expense, no in-person contact with DMV personnel, and no license-control actions.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

Adopting one of the study's recommendations, the department has decided to send customized warning letters to drivers receiving repeat TVS dismissals or any combination of TVS and other entries equaling three.

SUPPLEMENTARY INFORMATION:

None.

TITLE: An Inventory of California Driver Accident Risk Factors

AUTHOR(S): Michael A. Gebers DATE: October 2003

FUNDING SOURCE: Departmental Budget REPORT NUMBER: 204

NTIS NUMBER: PB2004-104093

PROJECT OBJECTIVE:

To provide highway safety administrators, insurance industry representatives, and researchers in the field of traffic safety with information for developing program and policy decisions.

SUMMARY:

This report updates information on a random sample of licensed California drivers as published in an earlier report prepared by the California Department of Motor Vehicles: *An inventory of California driver accident risk factors* (Gebers & Peck, 1994). This report presents driver record information on a random sample of over 200,000 California drivers and driver record histories over varying time periods. The report addresses the following issues related to the assessment of traffic accident risk:

- Driver record in relation to gender and age.
- Accident-repeater phenomenon.
- Relationship between traffic accidents and citations.
- Relationship between traffic accidents and multiple driver record variables (e.g., prior accidents and citations, sex, and license class).
- Multiple logistic and negative binomial regression equations of accident risk factors and relativities.

Findings presented in the report confirmed that prior total citation frequency continues to be the most significant predictor of accident involvement, followed by prior accident involvement frequency. Increased accident involvement was shown to be associated with increased prior citation and accident frequencies, possessing a commercial driver license, being young, being male, having a medical condition on record, and having a physician referral for low visual-acuity on record.

IMPLEMENTATION STATUS OF FINDINGS AND RECOMMENDATIONS:

Not applicable – findings provided continued support for the departmental policy of using neg-op points to trigger driver control actions.

SUPPLEMENTARY INFORMATION:

See Janke, Masten, McKenzie, Gebers, and Kelsey, Report #194.